



Owners Manual

**Please read this manual
thoroughly before attempting to
install, connect or operate your
Watermaker.**

INDEX

- 3. WATERMAKER PRINCIPLES**
- 4. WORKING PARTS & FUNCTION**
- 5. MEMBRANE PIPING DIAGRAM**
- 6. PANEL LAYOUT DIAGRAM**
- 7. OPERATION INSTRUCTIONS**
- 8. THEORETICAL MEMBRANE PRODUCTION GRAPH**
- 9. THE IMPORTANCE OF USING DECHLORINATED WATER**
- 10. FLUSHING THE SYSTEM WITH FRESH WATER**
- 11. SHORT PERIOD LAY-UP INSTRUCTIONS**
- 12. PRESERVATIVE CHEMICAL INFORMATION**
- 13. WINTER LAY-UP INSTRUCTIONS**
- 14. ROUTINE MAINTENANCE**
- 15. MEMBRANE CLEANING INSTRUCTIONS**
- 17. CLEANING CHEMICAL #1 INFORMATION**
- 18. CLEANING CHEMICAL #2 INFORMATION**
- 19. INSTALLATION GUIDE**
- 21. COMMISSIONING**
- 23. REPAIR & SERVICE INFORMATION**
- 24. TROUBLESHOOTING**
- 27. CONTROL BOX ELECTRICAL SCHEMATIC**
- 28. REMOTE CONTROL ELECTRICAL SCHEMATIC**
- 29. LOW PRESSURE SAFETY SWITCH**
- 30. HIGH PRESSURE PUMP MAINTENANCE**
- 32. LOW PRESSURE PUMP MAINTENANCE**
- 34. SPARES PRICE LIST**
- 35. WARRANTY**

Aquafresh Reverse Osmosis Watermaker
Installation, Commissioning & Operation Manual

All Models

Owners and operators of Aquafresh water makers are urged to read this manual thoroughly as, by understanding the principles of osmosis, operational problems will not occur and satisfaction with your unit will be obtained.

All elements of the system are described in detail to give you a working knowledge of their function in order that minor defects may be overcome before they lead to major problems and expensive repairs or worse.

Please read this manual through before attempting to install, connect or run the system.

Principles

Dictionary definitions:

Osmosis *n.* 1. the tendency of the solvent of a less concentrated solution of dissolved molecules to pass through a semipermeable membrane into a more concentrated solution until both solutions are of the same concentration.

Osmotic pressure *n.* the pressure necessary to prevent osmosis into a given solution when the solution is separated from the pure solvent by a semipermeable membrane.

When the pressure on a concentrated solution of dissolved solids is increased then **reverse osmosis** takes place and molecules of the pure solvent (water in our case) pass through the membrane from the concentrated solution. The pressure required to achieve this phenomena is proportional to the concentration of dissolved solids. ie a 1% solution of salt requires approximately 100 psi (7 Bar) and sea water at 35,000 ppm requires approximately 800 psi (55 Bar).

It is this principle that is used in the operation of your **Aquafresh** reverse osmosis watermaker.

Working Parts and Function

There are basically two types of Aquafresh watermaker. One uses an A.C. supply to drive the high pressure pump, the other uses an engine driven high pressure pump. The model numbers are suffixed with either AC or ED to identify each type. In the case of the engine driven units either 12 or 24 volts is required to operate the installation.

System Function

Sea Water

Sea water is drawn into the system by the low pressure, centrifugal priming pump (LP Pump), via a 3/4 inch inlet sea cock, strainer and 'L' port valve. The other position on the 'L' port valve is a 1/2 inch 'SERVICE' connection for the intake of cleaning and disinfecting solutions, this connection may also be used to prime the LP Pump when necessary. The output of the LP Pump feeds the first (25 micron) of two system filters.

A double filter system is then added where the condition of the filters may be seen through the transparent filter bowls or by reference to the optional low pressure gauge. In service, the filters will darken from their natural white colour, becoming almost black when badly contaminated and in need of changing.

From the second (5 micron) filter the sea water is fed at low pressure, of at least 3 psi, to the inlet manifold of a positive displacement, high pressure pump. This can create a pressure of up to 1400 psi, however, the pressure is controlled to below 1000 psi by a pressure relief safety valve and excess sea water is discharged overboard via the salt water discharge port.

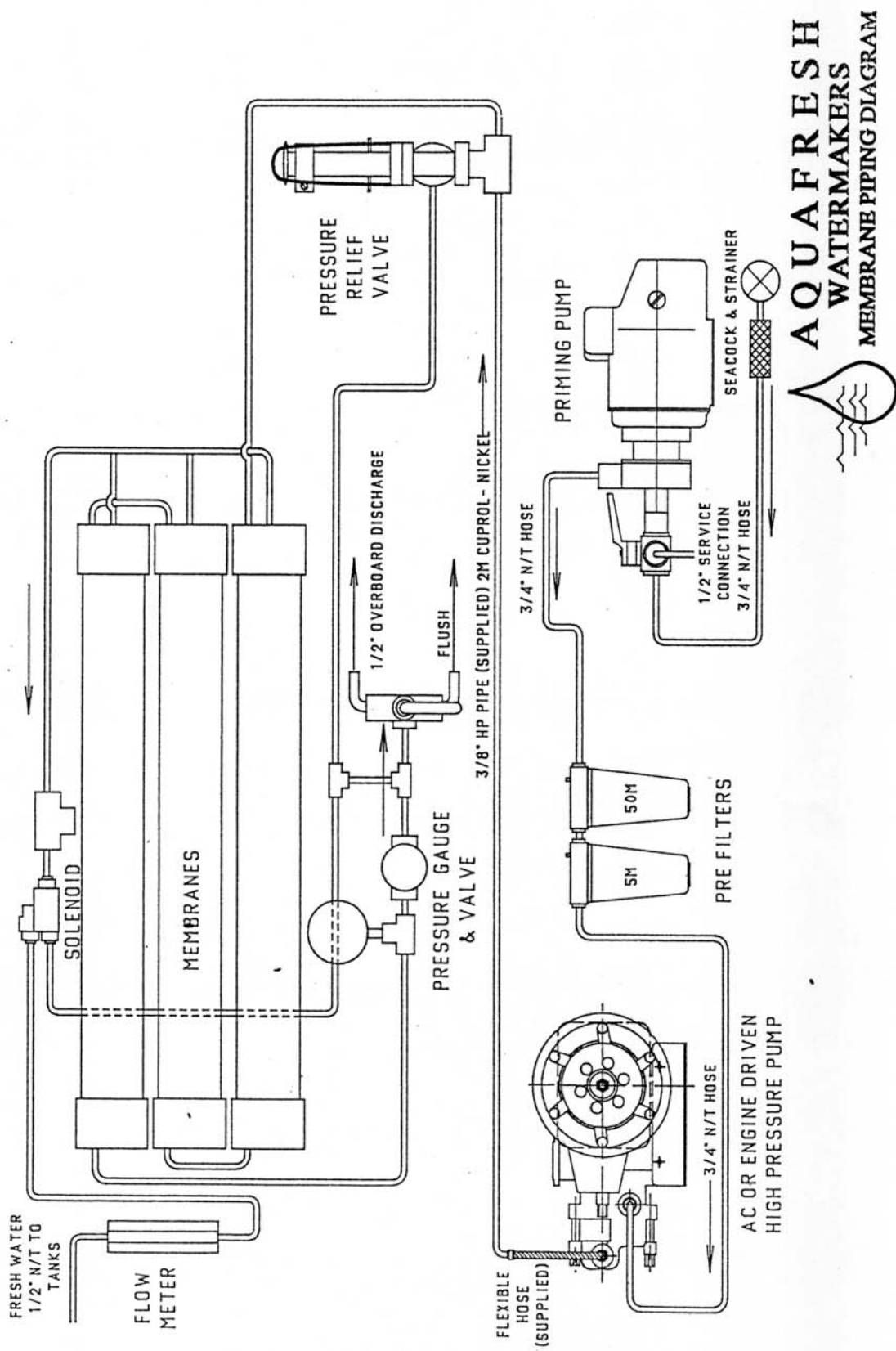
The pressurised flow of sea water passes through the Reverse Osmosis Membranes (RO membranes), the number in the system being dependant upon system size, and is then discharged via the Pressure Regulating Valve and salt water discharge port. It is essential for a flow of salt water, proportional to its salinity, to pass over the membranes at the correct rate and pressure. The pressure regulating valve controls back pressure which can be adjusted up to 900 psi, depending on salinity and water temperature, and indicated on the high pressure gauge. The sea water is then discharged overboard via the salt water discharge port.

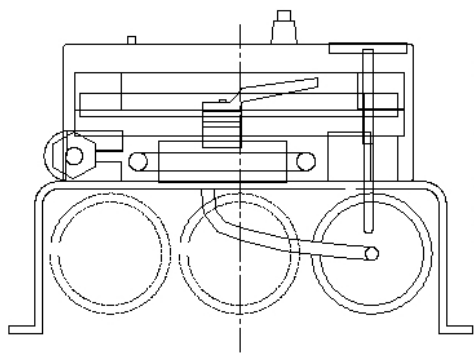
Fresh Water

The fresh water connections on the end of the RO membranes are interconnected and pass via the salinity sensor to a solenoid operated 3 way valve, except in the case of the 'Simplex' unit where the water has to be manually tasted before diversion to the vessels tanks. Water which has been 'sensed' as satisfactory causes the solenoid to operate allowing the water tanks to be filled. Unsatisfactory water is discharged via the salt water discharge port.

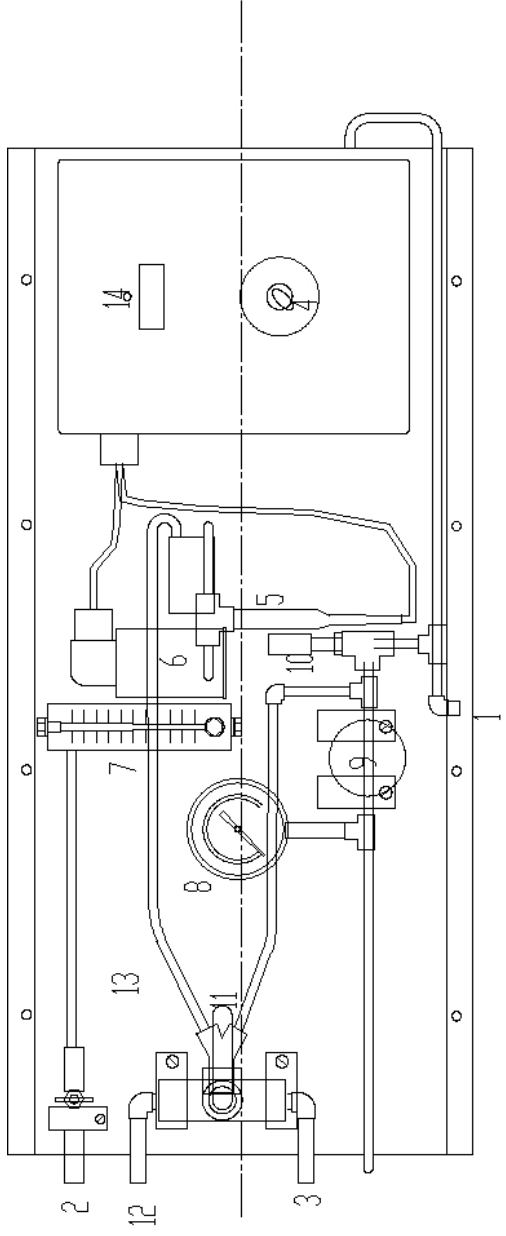
Sensing of the water is achieved by measuring the conductivity of the RO membranes output. Pure water offering lower conductivity than salt water.

The salinity control allows the user to control output in relation to local sea water salinity and temperature. Typically in Atlantic waters the control is set lower, about level 2 whereas in the Med, where the water salinity can be much higher, a level of 4 or more may be set.



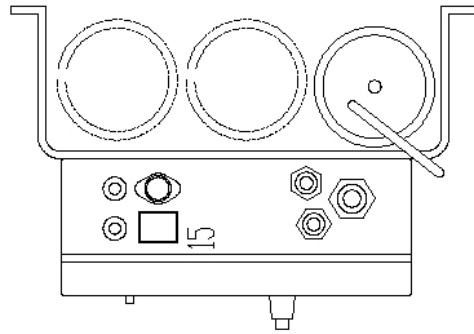


END ELEVATION



PLAN ELEVATION

- 1 Salt Water Intake
- 2 Freshwater Out
- 3 Salt Discharge
- 4 Salinity Control
- 5 Salinity Probe
- 6 Solenoid Valve
- 7 Flow Meter
- 8 Pressure Gauge
- 9 Pressure Adjust Valve
- 10 Over Pressure Relief Valve
- 11 Service Valve
- 12 Flush Discharge
- 13 Panel
- 14 Control Box
- 15 Service Switch



END ELEVATION

Operation

Switching ON

1. Ensure that the electrical power lamp on the Remote Control panel is illuminated.
2. Ensure that ALL system sea cocks are fully open. Set the salinity control to the desired position (typically 2 to 4 in UK waters).

Note: If the unit is being operated for the first time, or has been laid up with preserving chemicals, ensure that the "salinity" control is rotated fully anti-clockwise, passed the click stop, to ensure discharge of product water overboard. Then run the system for a minimum period of 1 hour before adjusting the "salinity" control to allow water to be stored.

3. Depress the On/Off switch.

The LP pump will run up first followed, after a short delay, by the HP pump. If a low pressure gauge is fitted, check that at least 7 psi is being developed, otherwise a change of filters or fouled inlet strainer is indicated.

4. Adjust the pressure regulating valve to give up to 825 psi, depending on water temperature and optimum RO membrane output. Output from RO membranes can vary by as much as + or -15% and figures are rated at a temperature of 25 Celsius. Over pressurising the RO membranes can cause irreversible damage. In areas where salinity is low ensure that the unit does not over produce as indicated on the product flowmeter. The maximum rate of fresh water flow indicated on the flow meter should NOT exceed 15% of that recommended in the 'Theoretical Membrane Production Graph'.
5. On Simplex units water quality is assessed by the operator tasting the output before allowing it to enter the vessels tanks and it is important that the water divert valve is closed to the tank. Allow the unit to run for at least 5 minutes before tasting and accepting water for input into the vessels tanks. It is recommended that the water be tasted at least every two hours during running to ensure that water is of an acceptable quality.

On units with automatic water sensing fresh water is flowing to the storage tanks when the green, 'FRESH' indicator is illuminated. Water is being rejected and discharged when the yellow, 'SALT' indicator is on.

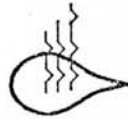
Switching OFF

1. Adjust the pressure regulating valve to reduce the high pressure to zero psi
2. Depress the On/Off switch ensuring that all but the power supply lamp extinguish.

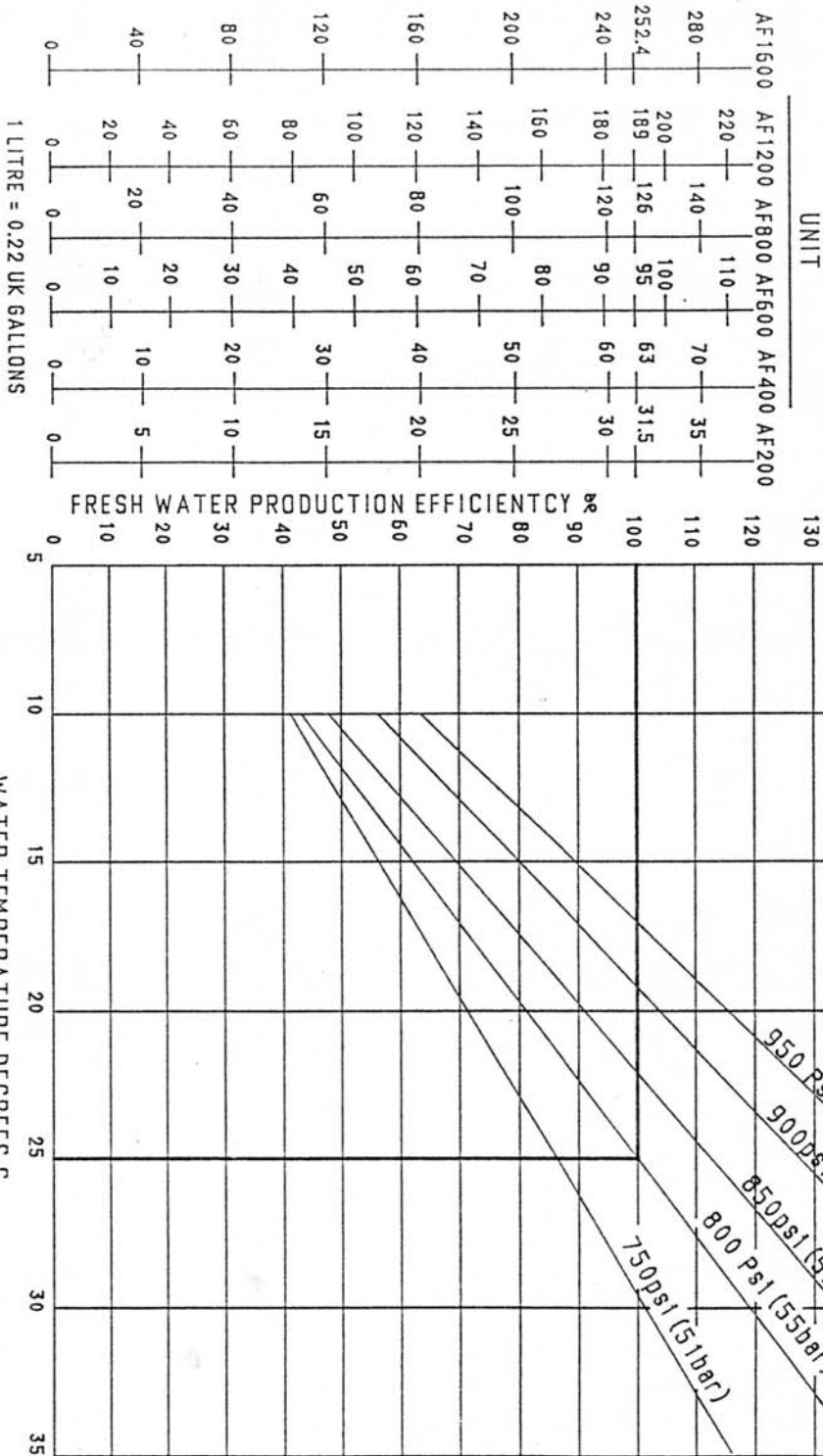
On Simplex units ensure that the water divert valve is closed to the vessels tanks so that on start-up water is dumped until an acceptable taste is sampled by the operator.

3. To prevent inadvertent operation isolate the water making system at the main supply panel.

Note: Because a watermaker can be installed on any vessel of any age, with any number of electrical supplies, the safest advice is always given in this manual. However, on a modern vessel with more than adequate electrical specification and generator sizing, there is no need to adjust the pressure valve whilst starting and stopping the unit. The reason for winding the pressure back is to allow for very small or older design generators to be able to cope with the starting loads of a unit under pressure.



AQUA FRESH WATERMAKERS THEORETICAL MEMBRANE PRODUCTION



INDIVIDUAL MEMBRANES MAY VARY BY
±15% RESULTS BASED ON ASSUMED
TEMPERATURE OF 25 DEGREES CELSIUS

The Importance of Using De-Chlorinated Water

Freshwater containing chlorine will damage your watermaker membranes.

When flushing or preserving your system, always use fresh de-chlorinated water.

This can be obtained by:

- a) Running a freshwater hose through a carbon filter
(available from Aquafresh Watermakers Ltd)
- b) Using water already produced by your watermaker
- c) Leaving an open bucket of fresh tap water to stand for 24 hours to allow the chlorine to evaporate.

Maintenance

The unexposed interiors of the RO membranes can promote algae growth in sea water and this can have the effect of reducing the output from the system. **There is a greater risk of algae growth in warmer waters.**

If the unit is to be left unused for a period of 10 to 21 days, the system can be flushed with fresh dechlorinated water to prevent fouling of the membranes.

If the unit is to be left unused for a period greater than 21 days, up to a maximum of 3 months, there is a greater risk of fouling, which should be prevented using a Preservative cartridge, available from Aquafresh Watermakers Ltd.

If the system is to be laid up where there is a possibility of freezing then the system **MUST** be filled with a special solution containing suitable glycol and disinfecting chemical. This is also available from Aquafresh Watermakers Ltd.

NOTE:

ON NO ACCOUNT MUST THE MEMBRANES BE ALLOWED TO BECOME DRY OR FREEZE, THIS WILL CAUSE IRREPARABLE DAMAGE.

FLUSHING THE SYSTEM WITH FRESH DECHLORINATED WATER (10 TO 21 DAYS):

Note:

Use either water produced by your Aquafresh watermaker or water that has been passed through a carbon filter.

1. Connect a plastic 1/2 inch hose to the input 'L' port valve, situated adjacent to the LP pump and fill with water so that no air remains in the pipe. Then holding your thumb over the end of the pipe place the end of the hose into a bucket of fresh dechlorinated water. Do NOT open the valve at this stage. Rotate the salinity sensor control fully anti-clockwise, passed the click-stop, to ensure all product water is discharged overboard.
2. Connect a 1/2 inch hose to the sea water output 'FLUSH' on the 'L' port valve situated on the unit and lead the hose to the bucket containing the fresh dechlorinated water. Do NOT open this valve to allow flow via the container as it is necessary to flush the water already in the system overboard first, done at the next stage.
3. Ensure that the pressure regulating valve is fully open.
4. Depress the 'SERVICE' switch on the main electrical control box, noting that the LP pump runs. Open the input 'L' port valve on the LP PUMP and allow approximately 1/3 of the freshwater to discharge overboard before opening the output 'FLUSH' on the 'L' port valve to circulate the fresh water through the system for a further 10 minutes. After 10 minutes, close the output Flush 'L' port valve to "SALT DISCHARGE" and allow all but the last drop of freshwater to discharge overboard before switching off the 'SERVICE' switch.
5. Close the inlet and discharge seacocks then close inlet 'L' port valve on the LP pump.
6. The system is now flushed and can be left for 21 days.

PRESERVING THE SYSTEM USING SINGLE PRESERVATIVE CARTRIDGE:

SHORT PERIOD LAY-UP (Maximum up to 3 months).

Note:

This procedure must not be carried out with either organic or inorganic cleaner in the system. Flush with fresh dechlorinated water prior to treatment. Use either water produced by your Aquafresh Watermaker or water that has been passed through a carbon filter.

WARNING:

This procedure uses Sodium Metabisulphite.

Spills and splashed areas should be treated immediately with copious volumes of fresh water.

Irritation will be caused to the eyes, by inhalation and by ingestion.

Wash skin with soap & water.

Irrigate eyes with water and obtain medical advice.

If inhaled, blow nose and wash nasal passages, obtain medical advice.

If ingested, rinse out mouth. Give water to drink, seek medical advice.

If large amounts of this fluid are ingested then induce vomiting, seek medical advice.

1. Connect a plastic 1/2 inch hose to the input 'L' port valve, situated adjacent to the LP pump and fill with water so that no air remains in the pipe. Then holding your thumb over the end of the pipe place the end of the hose into a bucket of fresh dechlorinated water. Do NOT open the valve at this stage. Rotate the salinity sensor control fully anti-clockwise, passed the click-stop, to ensure all product water is discharged overboard.
2. Connect a 1/2 inch hose to the sea water output 'FLUSH' on the 'L' port valve situated on the unit and lead the hose to the bucket containing the fresh dechlorinated water. Do NOT open this valve to allow flow via the container as it is necessary to flush the water already in the system overboard first, done at the next stage. Remove both of the filters from their bowls and screw back into place.
3. Ensure that the pressure regulating valve is fully open.
4. Depress the 'SERVICE' switch on the main electrical control box, noting that the LP pump runs. Open the input 'L' port valve on the LP PUMP and allow approximately 1/3 of the freshwater to discharge overboard before opening the output 'FLUSH' on the 'L' port valve to circulate the fresh water through the system for a further 10 minutes. After 10 minutes, close the output Flush 'L' port valve to "SALT DISCHARGE" and allow all but the last drop of freshwater to discharge overboard before switching off the 'SERVICE' switch.
5. Place the Preservative cartridge (Green) into either filter housing and screw into place. Refill the bucket with fresh dechlorinated water.
6. Press the service switch to start the Priming pump. Let the pump run for 30 minutes, allowing the Preserving chemical to circulate fully.
7. After 30 minutes, depress the 'SERVICE' switch, the LP pump should stop.
8. Close the inlet and discharge seacocks then close inlet 'L' port valve on the LP pump. The system will now be full of the Preserving solution. Remove the 1/2 inch hoses and discard any chemical solution that remains, flushing away with copious amounts of water.
9. The suggested time for the unit to be stored is for up to 3 months after the use of this cartridge. If the unit will sit for more than 3 months, repeat this procedure every 3 months.
10. When using the watermaker again, ensure that the 'SALINITY' control is rotated fully anti-clockwise passed the click-stop, to ensure discharge of product water overboard and run the system for a minimum period of one hour before adjusting the 'SALINITY' control to allow water to be stored.

Product Information Sheet
MEMBRANE PRESERVATIVE CHEMICAL #3

1. Hazard Data: Appearance and Odor: Solubility in Water: pH of 1% Solution <small>25°C</small> Fire and Explosion data: Reactivity Data: Hazardous Polymerization: Toxicity:	Moderate health hazard, irritant Coarse white granules with sulfur dioxide odor Complete 4.5 No hazard exists Minimal Will not occur . TLV 5
2. Health Hazard Information: (a) Oral Ingestion: (b) Eye Contact: (c) Skin Contact: (d) Inhalation:	Not considered a primary route of contact Considered a moderate irritant Considered a mild irritant Considered a moderate irritant
3. Emergency First Aid: (a) Oral Ingestion: (b) Eye Contact: (c) Skin Contact: (d) Inhalation:	Do not induce vomiting. If conscious, give lots of water or milk. Get immediate medical attention. Flush eye immediately with large volume of water for 15 minutes lifting eyelids occasionally. Get medical attention. <i>Wash</i> contacted area with soap & water. Launder clothing before reuse ' Remove o fresh air. Give artificial respiration if not breathing. Get immediate medical attention.
4. Spill or leak: Steps to be taken in case material is released or spilled. (a) Sweep/shovel into salvage containers (b) Flush area with water to remove final traces	
5. Waste Disposal Method: (a) Material may be diluted with water and flushed into an approved drain (b) Comply with all applicable federal, state, and local regulations	
6. Special Protection Information: (a) Respiratory Protection: (b) Ventilation: (c) Protective Gloves: (d) Eye Protection:	NIOSH approved respirator Local mechanical exhaust Acid-resistant gloves Chemical goggles. Contact lenses should not be worn.
7. Handling and Storing:	Conform to normal warehousing conditions
8. Product Information:	Membrane preservative is a mild acidulating and reducing agent for use as a bleach, antichlor, antiseptic in the fermentation industries and food preservative.

WINTER LAY-UP (Where freezing conditions may occur)

Note:

**This procedure must NOT be carried out with either organic or inorganic cleaner in the system. Flush with fresh dechlorinated water prior to treatment.
Irreparable damage will result if the system is not protected from freezing.**

WARNING:

The winter lay-up fluid contains:

Propylene Glycol-20% Sodium Metabisulphite-1% Purified Water-to 100.

Irritation will be caused to the eyes, by inhalation and by ingestion.

Wash skin with soap & water.

Irrigate eyes with water and obtain medical advice.

If inhaled, blow nose and wash nasal passages, obtain medical advice.

If ingested, rinse out mouth. Give water to drink, seek medical advice.

If large amounts of this fluid are ingested then induce vomiting, seek medical advice.

1. Connect a suitable hose to the flush connection on the LP pump so that water may be flushed through the system for at least 5 minutes. Use water which has either been produced by the unit or, if using shore supply, passed through a carbon filter to remove chlorine. When connecting the hose ensure that all air is purged from the hose before going to the next stage. Rotate the 'SALINITY' control fully anti-clockwise, passed the click-stop where fitted, or disconnect feed to tanks to ensure that no contamination of the tanks takes place.
2. Depress the 'Service' switch and open the 'L' port valve on the LP pump to allow water to flush through the system for at least 5 minutes and then switch off. If fluid is not flowing through the LP pump check for an air lock and remedy.
3. Taking care not to allow air into the system place the hose from the LP pump into the container of winter lay-up fluid. Connect a suitable length of hose to the output flush 'L' port valve on the unit and place the end of the hose into the container of winter lay-up fluid. Do not change the position of the 'L' port valves at this stage.
4. Depress the 'Service' switch and allow the level of winter lay-up fluid to drop by 1/3 and change the position of the output flush 'L' port valve to allow circulation of winter lay-up fluid. Allow circulation for 15 minutes.
5. Open the output flush 'L' port valve on the unit and allow fluid to discharge overboard until 1 inch remains in container. Switch off service switch. Close the 'L' port valve on the LP pump, inlet and outlet sea cocks.
6. Place prominent notice of winter lay-up so that inadvertent ingestion of the fluid and operation of the system does not take place.
7. When recommissioning the system ensure that the 'SALINITY' control is rotated fully anti-clockwise, passed the click-stop, and/or disconnect the system fresh water feed to the vessels water tank(s) to prevent the possibility of contaminated water entering the vessels supply. The hose end should be positioned so that one hours production is allowed to discharge overboard or into bilge. Open all system sea cocks and visually inspect the system for any obvious defects or leaks below the waterline.
8. Ensuring that the pressure regulating valve is fully open, to prevent pressure build up, depress the 'Service' switch and allow sea water to flush through the system for at least 5 minutes and switch off .
9. Depress the system on/off switch and after approximately 10 seconds the HP pump will start.
10. Set the 'Salinity' control fully anti-clockwise, passed the click-stop where fitted, and then adjust the pressure regulating valve for a pressure gauge reading relating to the temperature and salinity of the sea water as indicated in the 'Theoretical Membrane Production Graph'. Allow the product to discharge overboard for at least one hour before re-setting the 'SALINITY' control for normal operation, and/or reconnecting the product hose to the vessels tanks. At this time you may wish to taste the water to ensure taste quality.
11. The system is now in commission.

ROUTINE MAINTENANCE

Daily checks

Check running hours of system for any routine maintenance which may be due.

Check system sea water strainer for debris and clean as required.

Visually inspect system for leaks and take remedial action as necessary.

Visually inspect the high pressure flexible pipe for chafe or 'bulging'. Replace if defective. If 'bulging' is seen do NOT run the water maker as a high pressure burst may occur. Contact Aquafresh Watermakers Ltd for replacement.

Check HP pump oil level and top up if required.

Check condition of both system micron pre-filters.

If badly discoloured, replace them. Under normal use offshore you can expect 100 hours or more use, unless plankton or sediment is prevalent. When replacing filters, always clean the clear filter bowls. DO NOT use a detergent, as this could contaminate the RO membranes. If the filter bowls are opened then you MUST bleed any air from the system by operating the 'SERVICE' switch and depressing the bleed vents on top of the filter bowls, only then operate the normal on/off switch which will allow the HP pump to function.

DO NOT ATTEMPT TO BLEED THE SYSTEM WITH THE HP PUMP RUNNING.

With engine driven HP pumps, Check belt drives for correct tension and excessive wear on systems.

Periodic Maintenance

First 50 hours: Change HP pump oil.

Every 500 hours or annually. Change HP pump oil

Lubricant types: Approved 'CAT' pump oils.

CAT High Viscosity Index Hydraulic Crankcase Oil

Obtainable from Aquafresh Watermakers Ltd

OR

BP Energol HLP 150

Esso Neuto 150

Texaco Regal ARNO 150

Castrol Hyspin ANS 150

Shell Tellus 150

Use only high quality hydraulic oil which is non-foaming and non-detergent. Do **NOT** use engine oil.

MEMBRANE CLEANING AFTER LONG TERM USE USING SINGLE USE CLEANING CARTRIDGES

DO NOT REMOVE REVERSE OSMOSIS ELEMENTS FROM THEIR HOUSINGS UNDER ANY CIRCUMSTANCES.

Under normal operation the RO membranes can be fouled by mineral scale, dirt and biological matter. Deposits can build up over a period of time causing lower output of fresh water and/or lack of salt rejection.

The system should be cleaned when the output of fresh water drops by more than 15% from the flow rate determined at time of commissioning. The output figure should however be adjusted for any temperature difference by reference to the Theoretical Membrane Output graph.

WARNING.

Caustic and acid solutions are used in the cleaning procedures and great care should be taken when handling. Rubber gloves and protective clothing should be worn. Spills and splashed areas should be treated immediately with copious volumes of fresh water.

Irritation will be caused to the eyes, by inhalation and by ingestion.

Wash skin with soap & water.

Irrigate eyes with water for at least 15 minutes and obtain medical advice.

If inhaled, blow nose and wash nasal passages, obtain medical advice.

If ingested, rinse out mouth. Give water to drink, seek medical advice.

If large amounts of this fluid are ingested then induce vomiting, seek medical advice.

When flushing the unit always use Fresh Dechlorinated Water.

Do **NOT** carry out the following treatments if Sodium Metabisulphite is in the system, first flush the system with fresh dechlorinated water.

Procedure

Membrane Cleaning for Organics & Particulates.

These cleaning cartridges contain irritants. Avoid contact with skin, eyes and clothing. Do not inhale dust.

Refer to relevant Health and Safety Data Sheet.

1. Rotate the 'SALINITY' control fully anti-clockwise, passed the click-stop, to discharge any product water overboard and/or disconnect the fresh water pipe feed to the vessels water tank to ensure that there is no possible risk of inadvertently contaminating the drinking water.
2. Connect a 1/2 inch hose to the input 'L' port valve on the priming pump and fill the pipe with water before placing your thumb over the end and placing the hose end into a bucket of fresh dechlorinated water. Do NOT open the valve to this inlet at this stage.
3. Connect a 1/2 inch hose to the output FLUSH 'L' port valve placing the hose end into the Freshwater. Do NOT open the valve to this inlet.
4. Remove the filters from their bowls, clean (DO NOT use detergent) and replace the now empty bowls
5. Check that the 'SALINITY' control is fully anti-clockwise passed the click-stop.
6. Open the pressure regulator valve fully so that no pressure is applied to the system.
7. Press the 'SERVICE' switch. Close the 'L' port valve on the LP pump to allow Freshwater to enter the system and allow approximately 1/3 of the freshwater to discharge overboard before closing the output flush 'L' port valve. Allow the unit to be flushed for approximately 10 minutes.

8. Adjust the pressure regulating valve to show a pressure of no more than 80 psi. No product water should be produced.

Note: During this process ensure that the level of liquid in the container is maintained above the 1/2 inch hose connected to the input 'L' port valve on the LP pump.

9. After 10 minutes, depress the 'SERVICE' switch to stop the Priming pump running.
10. Place cleaning filter #1 (Blue) into either filter housing and screw into place. Press the 'SERVICE' switch to start the Priming pump.
11. Let the pump run for 30 minutes to allow the chemical to circulate.
12. After 30 minutes, depress the 'SERVICE' switch, the LP pump will stop. Remove the cleaning filter and screw empty housing back into place. Empty the bucket of chemical solution and refill with Fresh dechlorinated water. Press the 'SERVICE switch and Flush the unit for 5 minutes. Press 'SERVICE' switch, the LP pump will stop.
13. Refill the bucket with Fresh dechlorinated water then return to step 10. for cleaning filter #2 (Red), then go to Step 14.

Note:

It is essential that both organic and inorganic cleaning procedures are carried out at the same time.

14. To return the unit to normal operation return the 'L' port valves to their normal position and remove the 1/2 inch hoses. Rotate the 'SALINITY' control fully anti-clockwise, passed the click-stop, to discharge any product water overboard and/or disconnect the product water feed to the vessels tanks.
15. Place new micron filters into their appropriate housings.
16. Using the 'SERVICE' switch to start the LP pump, bleed the system by depressing the buttons situated on top of the filter housings. On completion switch off using the 'SERVICE' switch.
17. Start the water maker in the normal way and run for at least one hour before reconnecting the output to the vessels water tanks.
18. Adjust the 'SALINITY' control and sample the water. When you are satisfied with the taste, reconnect the output to the vessels storage tanks.
19. If a chemical taste should still be present then run the system for a further 30 minutes and repeat process 17.

Product Information Sheet

CLEANING CHEMICAL #1 (BLUE)

1.	<p>Hazardous Material:</p> <p>Active Ingredient: Mixture contains no hazardous materials</p> <p>Hazard Data (Threshold Limit Value (TLV), Lethal Dosage (LD50), Phosphates/organic acids</p> <p>Lethal Concentration (LC50): None</p> <p>Appearance and Odor: White Powder, odorless</p> <p>Solubility in Water: Complete</p> <p>pH of 2.4% Solution: 11+/-0.5</p> <p>Fire and Explosion data: No hazard exists</p> <p>Reactivity Data: Stable</p> <p>Incompatibility: Avoid contact with aluminum</p> <p>Hazardous Polymerization: Will not occur</p> <p>Toxicity: No TLVs have been established for this mixture</p>
2.	<p>Health Hazard Information:</p> <p>(a) Oral Ingestion: Not considered a primary route of contact</p> <p>(b) Eye Contact: Considered a moderate irritant</p> <p>(c) Skin Contact: Considered a mild irritant</p> <p>(d) Inhalation: Not considered a primary route of contact</p>
3.	<p>Emergency First Aid:</p> <p>(a) Oral Ingestion: Not applicable</p> <p>(b) Eye Contact: Flush eye immediately with large volume of water. Get medical attention.</p> <p>(c) Skin Contact: Flush contacted area with water. Launder clothing before reuse.</p> <p>(d) Inhalation: Not applicable</p>
4.	<p>Spill or leak: Steps to be taken in case material is released or spilled.</p> <p>(a) Vacuum or sweep/shovel into salvage containers</p> <p>(b) Flush area with water to remove final traces</p>
5.	<p>Waste Disposal Method:</p> <p>(a) Material may be diluted with water and flushed into an approved drain</p> <p>(b) Comply with all applicable federal, state, and local regulations</p>
6.	<p>Special Protection Information:</p> <p>(a) Respiratory Protection: None required</p> <p>(b) Ventilation: None required</p> <p>(c) Protective Gloves: Standard work gloves</p> <p>(d) Eye Protection: Safety glasses</p>
7.	<p>Handling and Storing: Conform to normal warehousing <i>conditions</i></p>
8.	<p>Product Information: Alkaline <i>detergent</i> is a powder cleaner specifically designed for the removal of organics, silt and other particulate deposits from polyamide membrane surfaces.</p>

Product Information Sheet
CLEANING CHEMICAL #2 (RED)

1. Hazard Data (Threshold Limit Value (TLV), Lethal Dosage (LD50), Lethal Concentration (LC50): Appearance and Odor: Solubility in Water: pH of 24% Solution: Fire and Explosion data: Reactivity Data: Hazardous Polymerization: Toxicity:	500 mg/24 hours on skin, Rabbit - moderate irritation 750 mg/24 hours in eye. Rabbit - severe irritation White Powder with a sweetish odor Complete 3 _ 0.5 No hazard exists Stabile Will not occur No TLVs have been established for this mixture
2. Health Hazard Information: (a) Oral Ingestion: (b) Eye Contact: (c) Skin Contact: (d) Inhalation:	Not considered a primary route of contact Considered a moderate irritant Considered a mild irritant Not considered a primary route of contact
3. Emergency First Aid: (a) Oral Ingestion: (b) Eye Contact: (c) Skin Contact: (d) Inhalation:	Not applicable Flush eye immediately with large volume of water. Get medical attention. Flush contacted area with water. Launder clothing before reuse. Not applicable
4. Spill or leak: Steps to be taken in case material is released or spilled. (a) Vacuum or sweep/shovel into salvage containers (b) Flush area with water to remove final traces	
5. Waste Disposal Method: (a) Material may be diluted with water and flushed into an approved drain (b) Comply with all applicable federal, state, and local regulations	
6. Special Protection Information: (a) Respiratory Protection: (b) Ventilation: (c) Protective Gloves: (d) Eye Protection:	None required None required Standard work gloves Safety glasses
7. Handling and Storing:	Conform to normal warehousing conditions
8. Product Information:	Acid Cleaner is a powder cleaner specifically designed for the removal of metal hydroxides, calcium carbonate and other similar scales from

INSTALLATION

1. **INLET.**
A seacock and strainer of not less than 3/4 inch diameter is required, mounted as low in the bilge as possible to minimise the risk of surface debris and oil ingestion. Ideally the system should have its own inlet, but should it be necessary to share the inlet with another service that service should only be used when the water maker is not working. On no account should the inlet to the water maker be shared with an engine or generator.
Use no ferrous materials in the inlet system. On steel hulls change to non-ferrous fittings as soon as possible and ensure that the ferrous metal is painted to protect the water maker, as ferrous fouling will irreparably damage the membranes.
2. **DISCHARGE.**
A discharge of at least 1/2 inch diameter, and which includes a shut-off valve, is required to be fitted at least 150mm (6 inches) above the waterline.
3. **PRIMING PUMP**
The priming pump is to be mounted below the waterline, between the strainer and the system filters. If the pump is mounted above the waterline then problems with priming the pump will be experienced. It should be as close to the seacock as possible and located in a dry, well ventilated, position. Use only 3/4 inch, non-toxic, reinforced hose to connect the priming pump to the seacock and system filter housings and secure with double hose clips. The priming pump is fitted with an 'L' port valve for 'Service' use and space must be available for access to this inlet.
4. **SYSTEM FILTERS**
Two filters are normally supplied, a 25 micron and 5 micron filter respectively from the priming pump. The filters should be mounted allowing adequate space for removal and replacement of the filter bowls. No electrical equipment should be mounted beneath the filters as spillage is likely to occur when changing the filter elements or cleaning the bowls. The low pressure gauge is fitted to the top of the filter system. If the optional Oil/Water separator is to be used, this should be installed after the micron filters.
Note: It is important that the hose connections between the sea cock and the LP pump and between the LP pump and the HP pump run in a steady incline with no peaks or troughs that can cause air locks.
5. **HIGH PRESSURE PUMP**
'AC' Model.
Using the anti vibration mounts supplied, fit the pump and motor on a level base, ensuring that the oil level in the pump will be horizontal. Ensure that there is adequate ventilation available to prevent the motor overheating, minimum 100mm space behind the motor fan. The crankcase will already be filled with the correct amount of oil. The HP pump must not be allowed to run dry as damage to the pump will occur. Ensure the breather hole in the oil cap is not covered.
'ED' Model.
The HP pump and electrically operated clutch should be rigidly mounted so that it is aligned with the power take off shaft or suitable drive pulley. If not mounted directly onto the engine then a tensioning arm is required to be fitted.
The body of the pump should be horizontally mounted athwartships in order to maintain the correct level of oil in the pump. The fore and aft alignment of the HP pump is governed by the position of the engine and drive pulley which is normally within acceptable limits; if in doubt contact Aquafresh Watermakers Ltd.
Slotted holes are provided in the pumps mounting bracket to allow for adjustment. Pump rotation must be observed and left or right handed pumps can be supplied by Aquafresh Watermakers Ltd.
DC clutch driven units complete with Low Pressure switch should be wired to the clutch as follows:
Line 1 – DC Positive
Line 2 – DC Negative
Line 3 + 4 – To Pressure switch

The HP pump operates at a speed between 1400 and 1500 rpm and it is necessary to fit suitable drive pulleys to achieve this speed. Care must be taken to ensure correct alignment of all rotating components. Drive belts are to be the same length and matched, and should be chosen so that further tensioning can be undertaken. The unit will run using one drive belt provided that sufficient tension and pulley contact is made available.

6. LOW PRESSURE CONNECTIONS.

Use good quality, reinforced, NON-TOXIC PVC hose. Ensure that hose will not flatten, either by adjacent objects or structures, or by having bends which are too tight. Clip all connections with stainless steel hose clips, double clipping all connections which are below the waterline.

7. HIGH PRESSURE CONNECTIONS.

Aquafresh Watermakers Ltd use Cupro-Nickel High Pressure Pipe and Reinforced Flexible Pipe to connect the high pressure components of the system.

It is important to avoid the possibility of chafing, use pipe clips which have rubber sleeving. This also minimises the transmission of HP pump noise to the structure of the vessel.

8. FRESH WATER TANK CONNECTION.

Use only non-toxic pipe, connected to the storage tank in such a way that no back pressure will be caused by the vessels storage system.

Tanks must be fitted with a vent which discharges overboard when the tank is full. Venting into the bilge is not recommended as this may cause flooding.

When commissioning the unit all water produced during the first hour should be discharged overboard as the preservative used in the membranes can cause minor intestinal irritation.

9. SALT DISCHARGE.

Use suitable 1/2 inch reinforced, PVC hose. Ensure that the hose run cannot be kinked, as back pressure can cause damage to the system.

10. REMOTE CONTROL.

This unit, although splash proof, should be mounted in a dry position. A cable is provided with plugs at either end to enable simple connection to the main control box.

11. ELECTRICAL CONNECTION.

Observe polarity when making all connections.

AC driven units use mains voltages, observe the same precautions.

Note. Attention should be made to the length of cable runs so that the voltage drop cannot affect correct operation of the system. Cable sizes of not less than 2.5mm are recommended. All cables should be clipped at regular intervals to prevent chafe.

Cable sizing should be to ABYC or RCD standards.

At the vessels distribution board circuit breakers for the system must be capable of carrying loads required to run the appropriate water making system used.

Circuit breakers on vessels main distribution board should reflect the following:-

12 Volt system	20 Amps
24 Volt system	10 Amps
240 Volt 50Hz Single Phase systems	16 Amps
380/415 Volt 50Hz 3 Phase systems	10 Amps
110 Volt 60Hz Single Phase systems	32 Amps

The above figures reflect maximum current at start-up, normal running requirements are lower.

Single Phase Systems

Connection of the LP pump is straight forward with terminations marked clearly inside the motor cover.

The HP pump has a junction box fitted onto the lead. Simply observe AC wiring conventions

Three Phase Systems

The low pressure pump should have the internal motor wiring configured for the correct operating voltage. Instructions are inside the motor's electrical cover.

Connect each phase conductor to the terminals marked '**A**', '**B**' & '**C**' respectively.

Connect the **Yellow & Green** conductor to the **motor Earth** terminal.

ROTATION OF THE MOTOR MUST BE IN THE SAME DIRECTION AS THE ARROW ON THE PUMP OUTLET. TO ACHIEVE CORRECT ROTATION INTERCHANGE ANY TWO PHASE CONDUCTORS.

The HP pump has a low pressure safety switch terminal block mounted adjacent to the normal motor connections and the cable marked HP pump should be connected as follows:

Conductor '**1**' connected to terminal '**U1**'.

Conductor '**2**' connected to terminal '**V1**'.

Conductor '**3**' connected to terminal '**W1**'.

Conductor '**4**' unused, cut back.

Conductors '**5**' & '**6**' connected to low pressure switch terminal block.

Yellow & Green conductor to **motor Earth** terminal.

THE HP PUMP MUST ROTATE TOWARDS THE PUMP HEAD. IF ROTATION IS INCORRECT INTERCHANGE ANY TWO PHASE CONDUCTORS.

COMMISSIONING

On completion of equipment installation, plumbing and electrical connection the system can be commissioned using the following procedure.

1. Open inlet and outlet seacocks, manually bleeding the system, starting from the inlet end. It may be necessary to bleed the low pressure pump. Inspect all connections below waterline for obvious leaks. Disconnect water makers fresh water connection to the vessels water tank and lead to position where approximately 1 hours output can be drained.
2. Ensure that all control switches on the system are de-selected. (Don't forget the SERVICE switch). Switch on power to the system at the vessels distribution board.
3. Remote and main control box power indicators should illuminate.
4. Fully open the pressure regulating valve.
5. Switch the 'SERVICE' switch to on. This will operate **only** the priming pump.
6. Bleed ALL air from the filters by depressing the buttons situated on top of each of the filter housings. Ensure that water is being discharged from the hull fitting and that no air is seen bubbling inside the filter housings. Should the pressure regulating valve be closed then discharge overboard will not occur.
7. Switch off at the 'SERVICE' switch. Adjust the salinity sensor fully anti-clockwise, passed the click stop to ensure that all water produced discharges overboard. Simplex units do not automatically sense water quality, see paragraph at end of this section.
8. Switch the unit on for normal running at the remote panel.
9. The priming pump will run up first, followed, after a short delay, by the HP pump. Should the HP pump start and stop continuously check that the inlet pressure is adequate and that water is flowing overboard. If the inlet pressure is above 3psi and the HP pump stops and starts then it is necessary to adjust the low pressure switch situated on the inlet to the HP pump.

10. For systems with a low pressure indicator check that pressure is above 3 psi. If inlet pressure from LP pump is adequate then it may be necessary to adjust the low pressure safety switch setting. This is carried out by adjusting the centre screw on the LP switch a quarter of a turn at a time (anti-clockwise to reduce operating pressure). This switch is incorporated to protect the HP pump from running dry and may be set just low enough to detect a positive pressure from the LP pump. The voltage across the switch is normally only 24 volts dc.
11. Inspect system for leaks, taking remedial action as necessary. Pay particular attention to any leaks around the vessel end caps as these can be easily damaged. Call Aquafresh if in any doubt
12. Slowly close the pressure regulating valve to obtain a reading of **up to 900 psi** (refer to 'Theoretical Membrane Production Graph') on the HP gauge. The gauge may fluctuate until air is purged from the system, however, bubbles of air which are visible passing through the fresh water flow meter are of no concern. **DO NOT EXCEED THE PRODUCT WATER OUTPUT FIGURES FOR THE TYPE OF UNIT BY MORE THAN 15% - IRREPAIRABLE DAMAGE TO THE MEMBRANES MAY RESULT.**
13. Adjust the salinity control after approximately 5 minutes running to a position when flow is seen to occur on the flow meter and the salt indicator switches to fresh. In waters where the salinity is 35,000 ppm and the temperature is approximately 15 degrees Celsius the setting is normally between 2 and 4.
14. Run the system, checking that the fresh water indicator remains illuminated and that water output indicated on the flow meter is flowing from the pipe normally connected to the storage tank. After running for 2 hours water may be tasted and the pipe re-connected to the vessels tank. Note the output indicated by the flow meter, checking this against the predicted output given by the 'Theoretical membrane production graph'. Mark the flow meter for future reference. Rotation of the salinity control fully anti-clockwise, passed the click-stop, disables the salinity sensor and de-activates the product water reject solenoid enabling the user to discharge all product overboard.

Note:

1. **During the early stages of operation of the system, check the pressure indicated on the HP gauge at regular intervals, as air in the system can cause changes in pressure setting.**
2. **The salinity control does not normally require readjustment unless water flow does not occur or the vessel is operating in an area where the salt water has changed temperature and/or conductivity characteristics.**

Aquafresh Simplex Units

The Simplex unit does not automatically sense water quality, this is carried out by the operator tasting the output at regular intervals, we recommend tasting regularly once water quality is accepted to prevent the tank contents spoiling. On shut-down it is important to ensure that the water divert valve is closed to the tank and that water is dumped until an acceptable taste is achieved after start-up. At start-up the unit should be allowed to run for at least 5 minutes before tasting and accepting water output for input into the vessels tanks.

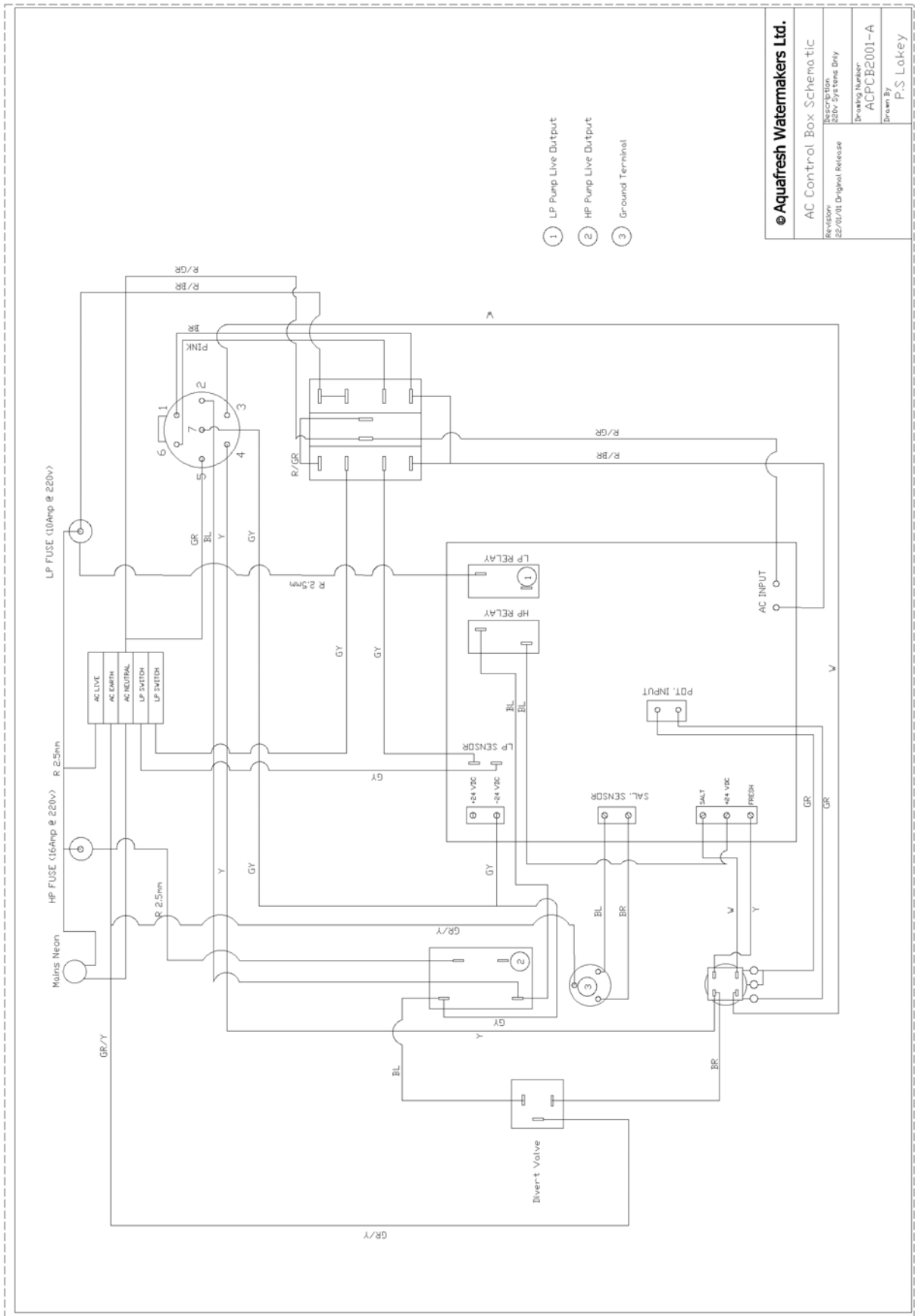
**REPAIR
&
SERVICE
INFORMATION
For your
AQUAFRESH WATERMAKER**

TROUBLESHOOTING

Symptom	Possible Cause	Remedy
Low pressure gauge (optional) indicates very low pressure or vacuum.	Inlet Strainer blocked.	Clear strainer & purge all air from system before running HP pump.
	Clogged filter(s).	Replace filter(s), & purge all air from system before running HP pump.
	Hull fitting fouled.	Clear fitting.
	Collapsed low pressure hose.	Check for restriction and remedy or replace hose.
	Air leaks in when running.	Reseal or re-tighten all fittings. Ensure bleed valves on filter housings are seating correctly.
	Low pressure pump will not start.	Check mechanical end of pump, if seized strip pump and carefully free off. Replace all seals.
System not priming.	Inlet sea cock closed.	Open sea cock.
	Air leak between inlet and LP pump.	Tighten all connections and re-seat strainer cap. Check 'L' port valve for leak.
	Low pressure pump and associated pipework above water line.	Remount low pressure pump and hoses below waterline.
	Hose from inlet too small.	Hose size must not be less than specified for size of system.
Water weeping from membrane end.	Compression joint or fitting weeps.	Adjust by tightening no more than one nut face at a time.
	Water seeps from membrane end.	Return complete membrane to Aquafresh Watermakers Ltd. Do not dismantle membrane.
Pulsation.	HP pump valve sticking.	Clean or replace valves.
	Cavitating.	Check low pressure system for leaks or restrictions.
	Worn seals.	Replace pump seals
Insufficient pressure	High pressure regulating valve out of adjustment or faulty.	Adjust high pressure regulating valve or replace.

Symptom	Possible Cause	Remedy
Insufficient pressure (continued).	High pressure safety relief valve out of adjustment or faulty.	Carefully adjust valve to 'blow off' at 950 psi. Under no circumstances allow pressure to exceed 1000 psi. Refer to Aquafresh Watermakers for service information.
	Belt slip. (Engine driven models only).	Tighten or replace belt drive.
	Air ingress.	Rectify leaks in LP system.
	Pressure gauge fault.	Replace.
	Leaking hoses.	Replace or repair.
Water leakage under HP pump manifold.	Worn seals.	Replace seals.
Oil leakage between manifold and crankcase.	Worn oil seals.	Replace seals.
Oil leakage around crankshaft.	Worn seal or O-ring.	Replace seal or O-ring.
	Unserviceable bearing.	Replace bearing.
Oil leakage from rear of crankcase	Damaged oil gauge, cover, drain plug or O-ring.	Rectify damage, replace O-ring.
Frequent packing failure or HP pump run dry.	Damaged or worn pistons.	Replace pistons. Do not run pump dry.
Power light not illuminated.	2 amp fuse blown.	Replace.
	Supply voltage too low.	Investigate cause.
Main circuit breaker keeps tripping.	Short circuit in system.	Remedy.
	Main circuit breaker unserviceable or of incorrect rating.	Replace.
LP pump will not run.	Motor overload tripped or fuse blown.	Investigate. Reset overload or change fuse. Use fuse of correct rating.

Symptom	Possible Cause	Remedy
HP pump suddenly stops or will not start.	Low pressure switch open circuit.	Check low pressure is above 3 psi. Adjust low pressure switch to close at 3 psi or change switch if defective. In emergency low pressure switch may be disabled if faulty by shorting the connections. Do NOT run HP pump dry.
	Motor overload tripped or fuse blown.	Reset overload or change fuse, adjust pressure regulating valve for minimum pressure and restart HP pump is cool.
HP pump does not start.	No voltage to start contactor or relay coil after normal 10-15 second delay.	Timing circuit on salinity pcb unserviceable, replace with serviceable item.
	Contactor/relay unserviceable.	Replace. The HP pump is powered up approximately 10 seconds after switching the system on.
Remote control indicators not illuminated.	'Service' switch on the main control box is selected.	De-select 'service' switch
	Plug disconnected on remote or main control unit.	Re-connect plug(s).
	Lamp failure.	Replace lamp(s).
Salt water indicator remains on.	Salinity control set too high.	Reset salinity control. Switch the unit off and set salinity control to maximum, then switch system on. Wait for approximately 2 minutes and slowly decrease salinity control until fresh water flows and indicator changes to 'fresh'.
	Salinity sensor dirty.	Remove, clean and replace. Ensure all connections are made.
	Membranes are badly fouled.	Carry out organic and inorganic cleaning process.
	Membrane(s) damaged.	Disconnect fresh water connections on membrane ends (centre) and taste water output. Blank off if faulty and return to Aquafresh Watermakers Limited at earliest opportunity for investigation. Do NOT attempt to dismantle the Membrane.
	Salinity circuit board failure.	Replace circuit board.
	3-way solenoid valve faulty or connections loose.	Check connections. Change output from solenoid valve manually by depressing small knob on side of valve body; turning 90 degrees clockwise to lock. Change valve.
Water discharges overboard even when fresh indicator is illuminated.		



© Aquafresh Watermakers Ltd.

AC Control Box Schematic

Revision: 22/08/01 Original Release

Description: 220v Systems Only

Breaking Number: ACPCB2001-A

Drawn By: P.S. Lahey



AC Remote Panel Schematic

Revisions:
22/01/01 Original Release

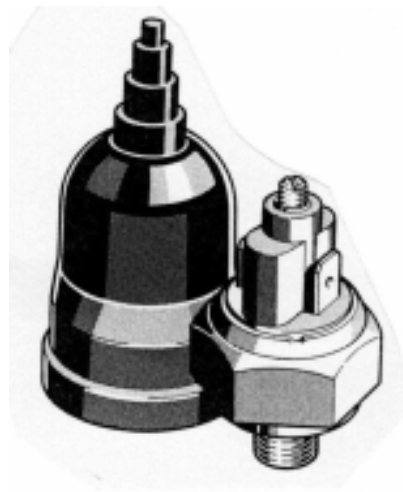
Drawing Number
ACREM2001-A

Drawn By
P.S Lahey

LOW PRESSURE SAFETY SWITCH

To prevent operation of the High Pressure pump when no water is present at the inlet, a Low Pressure switch is installed in the low pressure inlet feed to the HP pump. If the HP pump stops and starts or cycles on and off after increasing the system pressure then it may be that the safety switch requires adjustment. This switch is factory set to 'open circuit' below an inlet pressure of 3 psi and may need slight adjustment by the user from time to time. The control voltage operates the HP interlock on the pcb in the control box.

To adjust the switch, expose the screw and contacts by lifting the protective boot. The voltage applied to the contacts is normally 24Vdc. Ensure that water is flowing normally by observing the discharge overboard with the HP regulator valve fully open. With the system running normally, rotate the adjusting screw on the pressure switch a quarter of a turn at a time anti-clockwise to reduce the operating pressure until cycling of the HP pump ceases. Increase the system pressure to the normal operating pressure by adjusting the pressure regulating valve and repeat the above procedure if necessary.



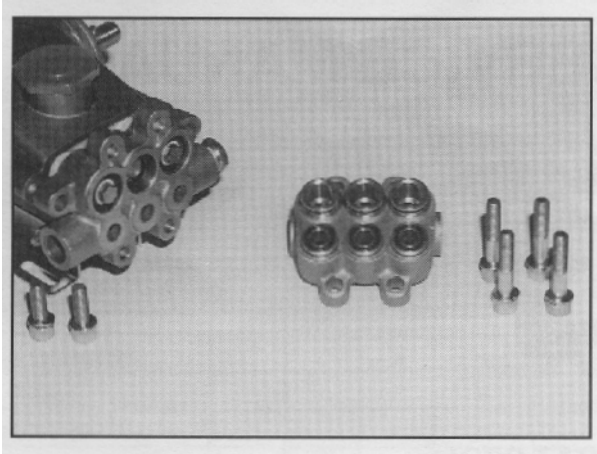
HIGH PRESSURE SAFETY SWITCH

Some models of Aquafresh water maker have a high pressure safety switch installed on the HP outlet to the HP pump to prevent pressurising the system above 1000 psi, other models use a mechanical pressure relief valve. This switch is factory set to 'open circuit' at a pressure above 950 psi and does not normally require user adjustment. The control voltage operates the HP interlock on the pcb in the control box.

It is important when making any adjustment to this switch not to exceed 1000 psi.

Slowly increase the system pressure to 950 psi and ensure that the pressure remains steady before making any adjustments. If the system switches off before reaching 950 psi then short the two connections on the **low pressure switch** to make sure that the system is not being controlled by this switch. If the system still fails to pressurise up to 950 psi then rotate the adjusting screw on the high pressure switch clockwise a quarter of a turn at a time. Remember that if the unit is being controlled by the switch it will take up to 20 seconds to re-start. If the pressure can be adjusted passed 950 psi then set the pressure to 950 psi and rotate the adjusting screw on the switch anti-clockwise a quarter of a turn at a time until the unit switches off.

HIGH PRESSURE PUMP MAINTENANCE



SERVICING THE VALVES

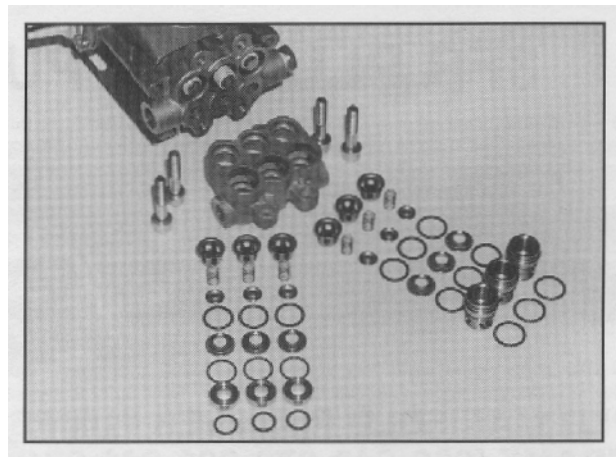
Disassembly

1. Remove the four (4) Socket Head Bolts and Spring Washers from end of Manifold.
2. Support the Discharge Manifold from the underside and tap with a soft mallet to separate from the Inlet Manifold.
3. Carefully place Discharge Manifold on work surface with crankcase side up.
4. From the three (3) **smaller diameter and shallow inlet chambers** remove the Inlet Valve Adapters with inner and outer O-Rings. These adapters are not held securely in position and may fall out as the Discharge Manifold is removed.
5. Next remove the Valve Seats, Valves, Springs and Retainers from the Inlet Chambers.
6. From the three (3) **larger diameter and deeper discharge chambers** remove the Discharge Valve Spacers with inner and outer O-Rings. These spacers generally remain with the Discharge Manifold as it is removed. Insert two screwdrivers under the lip of the Spacer and pry the Spacers from the Manifold chamber.
7. Next remove the Valve Seats, Valves, Springs and Retainers from the discharge chambers.
NOTE: The inlet and discharge use the same Retainers, Springs, Valve Seats and Valves. The O-Rings and valve spacers/adapters are different. **Keep parts in order as they are removed.**

Reassembly (Discharge)

Note: For certain applications, apply liquid gasket to O-Ring crevices and seal surfaces. See Tech Bulletin 53 for model identification.

1. Place the **crankcase side of the Discharge Manifold up.**
2. Examine the Spring for fatigue or breaks and place the new Spring into the Retainer.
3. Then insert the new Springs into the Retainers over the plastic center guide and place the Valve Spring Retainers in the **deeper valve chambers.** They will rest on the machined ridge in each chamber.
4. Examine the Valves for wear or pitting and replace if necessary. Install valves over springs with **concave side down.**
5. Examine Valve Seat O-Rings for wear and replace. **Place O-Rings on lip of retainers.** Carefully square O-Rings in valve chamber to avoid cutting O-Ring when Valve is installed.
6. Examine Valve Seats for pitting, scale or ridges and replace if necessary. Install Valve Seat with **concave side down**, so O-Ring fits snugly into groove on Seat.



7. Examine both inner and outer O-Rings on the Discharge Valve Spacer and replace if necessary. Lubricate O-Rings and fit **into grooves on outside of spacer.**
8. Apply liquid gasket to the O-Ring crevices on the O.D. of Discharge Valve Spacers and carefully press into valve chambers with **small diameter side down** until Spacer snaps tightly into position.

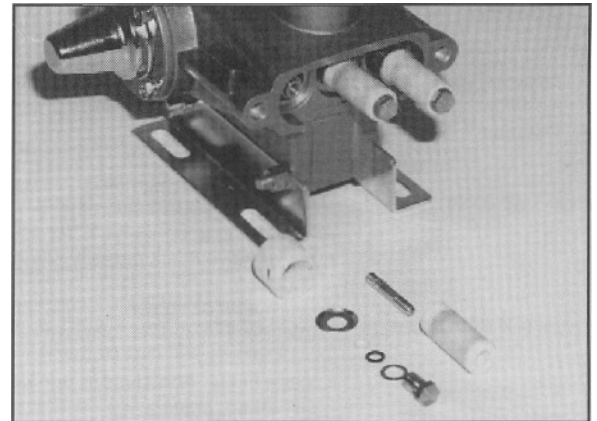
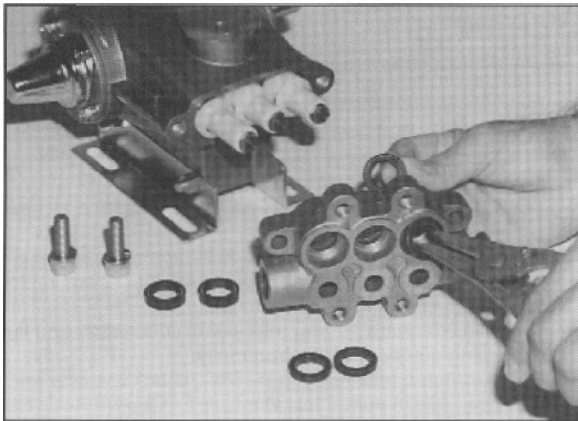
Reassembly (Inlet)

1. Insert Valve Springs into Retainers over plastic center guide and place Valve Spring Retainers into the **shallow Valve Chambers.** They will rest on the machined ridge in each chamber.
2. Inspect the Valves for wear, ridges or pitting and replace if necessary. Insert Valves over the Springs with **concave side down.**
3. Examine Valve Seat O-Rings for wear and replace. **Lubricate and place O-Rings on lip of retainers.** Carefully square O-Rings in Valve Chamber to avoid cutting O-Ring when Valve Seat is installed.
4. Examine Valve Seats for pitting, scale or ridges and replace if necessary. Install Valve Seat with **concave side down**, so O-Ring fits snugly into groove on Seat.
5. Examine both the **inner and the outer** O-Rings on the Inlet Valve Adapter and replace if worn. Lubricate O-Rings and **fit into grooves on outside of adapters.**
6. Apply liquid gasket to the O-Ring crevice of the O.D. of Inlet Valve Adapter and press into chamber. Carefully square Inlet Valve Adapter into chamber to avoid cutting or extruding O-Rings.
7. Replace Discharge Manifold over Plunger ends **matching Discharge Valve Spacers with Inlet Manifold Chambers** and press into position. Tap with a soft mallet until Inlet and Discharge Manifolds are flush.
8. Replace all four (4) Washers and Socket Head Bolts. Hand tighten each. Then torque per chart.

SERVICING THE SEALS

Disassembly

1. With Discharge Manifold removed from the pump remove the two (2) Socket Head Bolts and spring washers from end of Inlet Manifold.
2. Rotate Crankshaft to loosen Inlet Manifold.
3. Support Inlet Manifold from underside and tap with a soft mallet to separate Manifold from Crankcase.
4. With **crankcase side of manifold down** remove Hi-Pressure Seals using a reverse pliers.
5. Invert Inlet Manifold so **crankcase side is up** and with reverse pliers remove Lo-Pressure Seals.



Reassembly

Note: For certain applications, apply liquid gasket to O-Ring crevices and seal surfaces. See Tech Bulletin 53 for model identification.

1. Examine Lo-Pressure Seal for wear or spring failure and replace if necessary. With **crankcase side of inlet manifold up**, press the new Lo-Pressure Seal into the Valve Chamber with **Garter Spring down**. Carefully square seal into position.
2. Examine Hi-Pressure Seal for wear and replace if necessary. Invert Inlet Manifold with **crankcase side down** and press the new seal into the Manifold chamber with **v-side up** (metal side down) until completely seated.
3. Rotate the Shaft so the two (2) outside Plungers are extended and lined-up.
4. Examine O-Rings on both the Discharge Spacer and Inlet Valve Adapter for cuts or wear and replace as needed.
5. **Lubricate Plungers** and carefully slide the Inlet Manifold over the Plungers and press into the Crankcase.
6. Replace two (2) M10 Inlet Manifold Socket Head Bolts, and Washers, hand tighten and then torque per chart.
7. Then carefully slip the Discharge Manifold onto Plungers and press the exposed Discharge Valve Spacers into the Inlet Manifold. Tap with a soft mallet until flush.
8. Replace the four (4) M10 Discharge Manifold Socket Head Bolts and Washers and hand tighten. Then torque per chart.
2. Carefully examine Ceramic Plunger for scoring or cracks and replace if worn. Slip onto Rod. **Ceramic Plunger can only be installed one direction (front to back).** Do not force onto Rod.
3. Examine O-Ring and Back-up-Ring on Plunger Retainer and replace if worn or cut. Lubricate O-Ring for ease of installation and to avoid damage to O-Ring. **First install NEW copper Gasket on Plunger Retainer, then O-Ring, then Back-up-Ring.**
4. Apply Loctite-242 to threads and install **short threaded end of Stud into Plunger Retainer.**
5. Apply Loctite-242 to threads and thread Plunger Retainer and Stud assembly **with long threaded end of Stud into plunger rod.** Torque per chart. **Exercise caution not to over torque the Plunger Retainer.**
6. Re-install the Seal Retainers with the **slots to the top and bottom.**
7. Rotate Shaft until the two (2) outside Plungers are extended and lined-up. Lubricate O.D. of Plungers.
8. Then carefully slip Inlet and Discharge Manifold assembly onto Plungers and tap with soft mallet until flush with Crankcase.
9. Replace the two (2) Inlet Manifold Socket Head Bolts and Washers and hand tighten. Then torque per chart.
10. Then torque the four (4) Discharge Manifold Socket HeadBolts in sequence per chart.

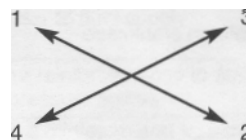
SERVICING THE PLUNGERS

Disassembly

1. Remove Discharge and Inlet Manifold as described.
2. Using a wrench loosen Plunger Retainers approximately three (3) to four (4) turns.
3. Grasp Ceramic Plunger and **push towards Crankcase** until Plunger Retainer with stud pops out.
4. Remove Plunger Retainer with O-Ring, Back-up-Ring and Gasket.
5. Next slip Ceramic Plungers, Keyhole Washer and Barrier Slings from each Plunger Rod.
6. Examine Crankcase Seal for deterioration and replace if needed. Consult Aquafresh Watermakers Ltd for crankcase servicing.

Reassembly

1. Replace Barrier Slinger if damaged when removing and position onto Plunger Rod with **concave facing out.** Then examine the Keyhole Washer and place on the Plunger Rod with the slot down.



SERVICING CRANKCASE SECTION

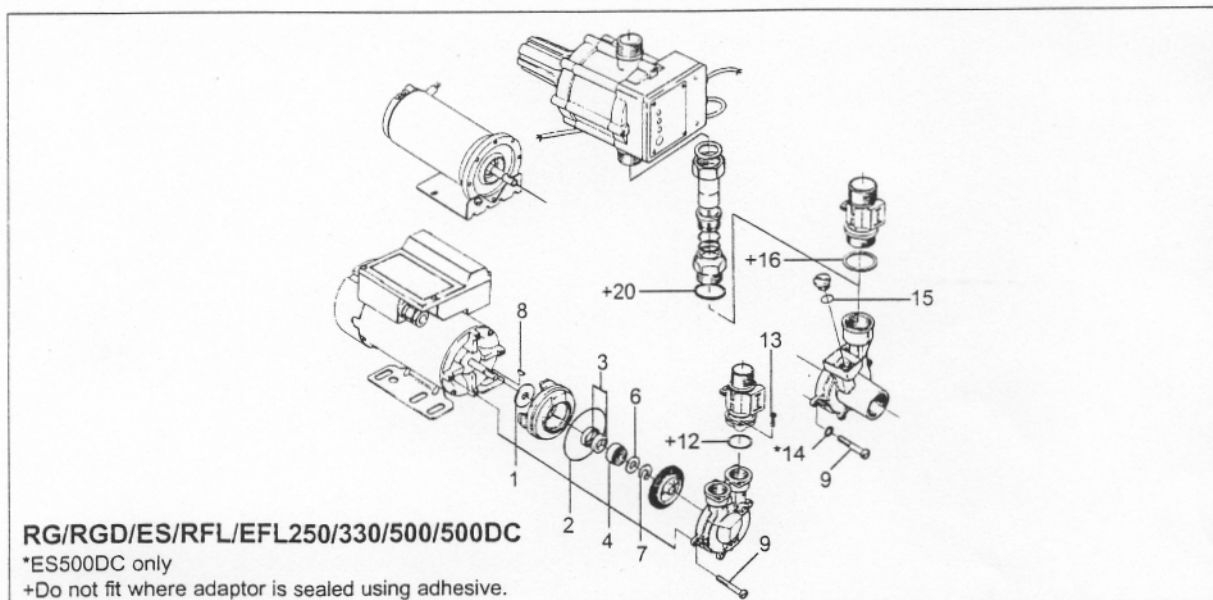
1. While Inlet Manifold, Plungers and Seal Retainers are removed, examine Crankcase Seals for wear.
2. Check oil for proper level and for evidence of water or other contaminants in oil.
3. Rotate Crankshaft by hand to feel for smooth bearing movement.
4. Examine Crankshaft Oil Seal externally for drying, cracking or leaking.
5. Consult Aquafresh Watermakers Ltd if crankcase service is required.

LOW PRESSURE PUMP MAINTENANCE AND PARTS IDENTIFICATION

KIT CONTENTS

- ITEM

ITEM		QTY	ITEM		QTY
1	Thrower Washer	1	12.	O Ring (24.6 mm ID)	1
2	O Ring (66.5 mm ID)	1	13	M4 x 16 Screw	2
3	Seal Counterface	1	14	M6 Lockwasher	4
4	Seal Bellows Assy	1	15	O Ring (12.5 mm ID)	1
5	Spacer	1	16	Fibre Washer (40 mm C.D.)	1
6	Stainless Washer	1	17	O Ring (80.5 mm ID)	1
7	E Clip	1	18	M8 Brass Nut	1
8	Woodruff Key	1	19	O Ring (15.5 mm ID)	1
9	M6 x 35 Screw	4	20	Fibre Washer (38 mm C.D.)	1
10	Sealing Washer 1/8 BSP	1	21	Applicator Tool	1
11	Sealing Washer 1/4 BSP	1			

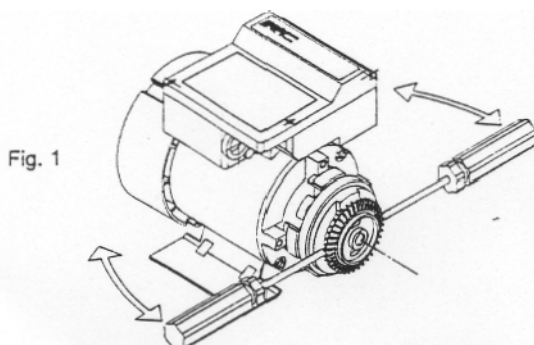


• PUMP PREPARATION

To prepare the pump to accept the service kit parts, each pump part must be removed noting its exact position and sequence.

Difficulties may be experienced in the removal of the impeller. To overcome this, 2 screwdrivers can be used to prize the impeller from the shaft as detailed in Fig. 1; ensuring equal pressure is applied to each side of the impeller to avoid shaft bending.

Now clean all the individual parts. Before fitting the new service kit parts the pump and seal type must be identified.



**NOTE: DO NOT USE EXCESSIVE
FORCE, AS THIS MAY DAMAGE
THE COMPONENTS**

SEAL IDENTIFICATION

The following information is only relevant for RG/ES 25/33/50 pump variants.

For certain pump variants, your seal arrangement may be different from that as supplied within the service kit.

The seal as supplied is an alternative and is shown in order of assembly in Fig. 2.

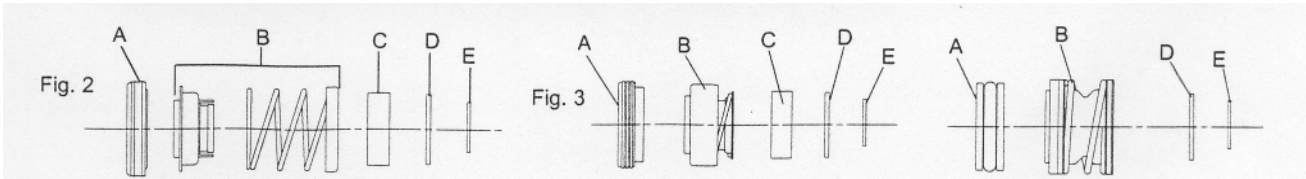
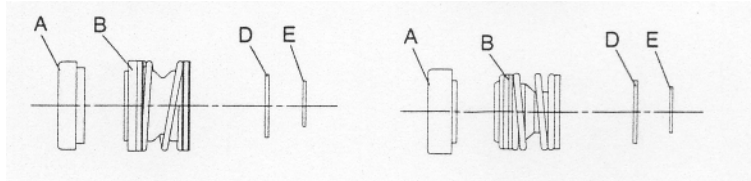
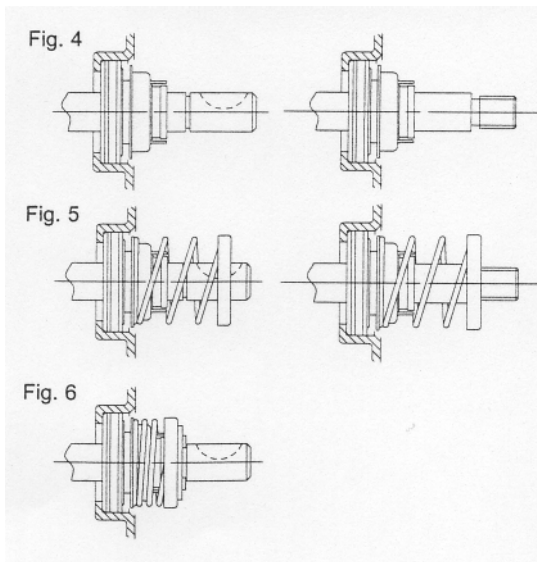
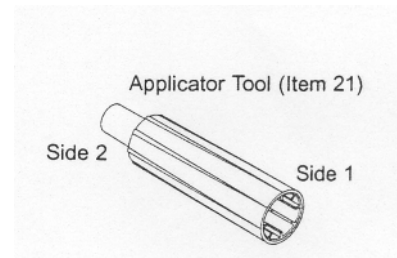


Fig. 3 details the other seal arrangements which the above seal will replace.

- A Seal seat complete with rubber cup washer.
- B Seal bellows assembly.
- C Plastic spacer.
 - Stainless steel washer.
 - Seal retaining clip.



- **MAINTENANCE AND CARE UPON ASSEMBLY** To allow ease of assembly along with correct functioning of the pump, the following points on assembly are necessary.
 - All pump parts must be free from debris and assembled correctly.
 - The seal must always be replaced as a complete unit using the seal applicator tool as provided.
 - The seal faces must not be handled or damaged.
 - The impeller must be a slide fit on the shaft.



To assemble the seal correctly, the shaft must be clean and the following steps carried out.

1. Use Side 1 of the Applicator Tool to push the seal seat (item A) firmly into the housing ensuring it is located flat against back of housing.
2. Now use Side 2 of the Applicator Tool to push the bellows section of the seal assembly (item B) onto the motor shaft until it is flat against the seal seat (see Fig. 4). The shaft may be lubricated with clean water to assist assembly.

Assemble the spring and location plate onto the shaft so as to complete the seal bellows assembly (see Fig. 5).

3. RG/ES/EFL600/800 variants only

The whole assembly can then be located into position by screwing the impeller hub (item 22) to its stop. The impeller locknut should then be secured.

or
3.

RGIRGD/ES/FL/RFL/EFL25/33150/250/330/500/500D C, 30/36 variants only

The spacer (item C) if required (see seal identification note) and washer (item D) can then be placed on the shaft and the whole assembly held into position by locating the E clip (item E) in the

• INITIAL OPERATING INSTRUCTIONS

- Do not run pump dry. Allow the pumped liquid to enter the pump body thus ensuring the seal is lubricated before switching the pump on. Failure to do this will damage the seal.
- Check the pump for leaks before leaving it unattended.

AQUAFRESH SPARES

PRICE LIST JAN 2003

Part No	Description	Price List £
AFF05	5 Micron Depth Filter (x3)	£11.50
AFF25	25 Micron Depth Filter (x3)	£11.50
AFFP05	5 Micron Pleated Filter (x3)	£22.80
AFFP30	30 Micron Pleated Filter(x3)	£22.80
AFFH10	Filter Housing c/w fittings	£105.60
AFFW	Filter Wrench	£10.80
AFVM02	Cartridge Cleaning Kit	£26.95
AFVM03	Cartridge Preservation Kit	£26.95
AFCH2	Winter Lay Up Fluid 5ltrs	£18.00
AFC01	Cat Pump Oil 1ltr	£7.20
AFST10	12V Priming Pump Seals Kit (Stuart Turner)	£28.80
AFST11	220V Priming Pump Seals Kit (Stuart Turner)	£48.00
AFC10	HP Pump Seals Kit	£104.70
AFST1	LP Pump 220v	£268.80
AFOS1	Oil /Water Separator 10"x 2 3/4"	£111.60
AFOS2	Spare Cartridge for Oil/Water Separator	£31.68
AFUV2	UV sterilizer 8 Watt 4 ltr/min	£274.80
AFUV3	UV Sterilizer 15 Watt 8 ltr/min	£331.20
AFUV4	Spare Bulb 8 Watt	£19.68
AFUV5	Spare Bulb 15 Watt	£24.12
AFFC1	Carbon Filter	£84.00
AFFC2	Carbon Cartridge	£15.84
AFB10	Start Capacitor G10	£27.60
AFB20	Run Capacitor G20	£27.60
AFLPS	LP Switch	£60.14
AFLP6	Impeller for LP Pump	£18.00
AFSS	Salinity Sensor	£33.94
AFB30	Divert Valve	£131.42
AFSV43	HP Relief Valve	£154.08
AFSW21	Membrane 21" x 2.5"	£248.80
AFSW40	Membrane 40" x2.5"	£412.85
AFPV21	21" Pressure Vessel inc end plugs &fittings	£223.20
AFPV40	40" Pressure vessel inc end plugs &fittings	£300.00

All prices ex works Plymouth ex VAT

20/04/01

WARRANTY

AQUAFRESH WATERMAKERS LIMITED, warrants to the original purchaser only that the Aquafresh system will be free from defects in material and workmanship under the conditions of normal use and service for a period of twenty four months from the date of installation or twenty eight months from date of dispatch of the goods from the factory, whichever is the earlier. Liability under this warranty shall be limited to repair or replacement of the defective system or component, at the option of Aquafresh Watermakers Limited and under no circumstances shall Aquafresh Watermakers Limited be liable for consequential, incidental or other damages arising out of or in any way connected, with the failure of the system to perform as set out herein.

In the unlikely event of a defect, malfunction or failure of the system during the warranty period, Aquafresh Watermakers Limited will repair or replace at its option without charge to the customer the system or component which upon examination by Aquafresh Watermakers Limited shall appear to be defective or not up to specification.

To obtain this service the defective component must be returned to Aquafresh Watermakers Limited together with proven date of purchase or delivery. Aquafresh Watermakers Limited shall not be liable for any transportation expenses.

This warranty does not extend to any system or component part which has been subject to misuse, neglect, accident, improper installation or subject to use in violation of the maintenance or operating instructions furnished by Aquafresh Watermakers Limited nor does it extend to products on which serial numbers have been removed or defaced. This warranty does not extend to the reverse osmosis membranes due to the possibility of unintentional damage by the user. Instead of warranty Aquafresh Watermakers Limited offer the customer an exchange service whereby Aquafresh Watermakers Limited will at any time during the system life replace any defective membrane or clean any fouled membrane for a charge equal to 75% of the then current list price for the membrane. The subject membrane shall be returned to Aquafresh Watermakers Limited with full payment enclosed, including transportation costs, and Aquafresh Watermakers Limited shall expedite the appropriate service.

This warranty extends to the original purchaser only and is in lieu of all other express or implied warranties including those of merchantability and fitness for a particular purpose.

Original Purchaser: Name:
Address:

Installed On: Vessels Name and Type:

Purchased From: Name:
Address:

Installation date:

Model No:

Serial No:

